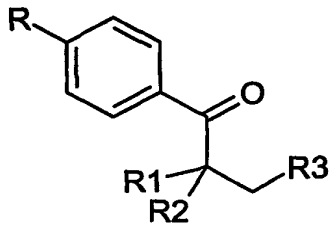
CLAIMS

1. Ester derivatives of hyaluronic acid or of hyaluronic acid derivatives, wherein part of the carboxylic groups of hyaluronic acid or of hyaluronic acid derivatives is esterified with the propiophenone derivatives of formula (I)



(I)

wherein R is selected from the group consisting of hydroxy, alkyloxy having an alkyl chain C1-C20 bearing one or more hydroxy groups, and heterocycle bearing one or more hydroxy groups;

and R_1, R_2 and R_3, equal or different amongst each other, are selected from the group consisting of hydrogen, hydroxy, alkyl C1-C20 possibly substituted with one or more hydroxy groups and alkyloxy C1-C20 possibly substituted with one or more hydroxy groups.

2. Ester derivatives according to claim 1, wherein the said propiophenone derivative is selected from the group consisting of 4-(2,3-dihydroxypropoxy)-3-methoxy-propiophenone, 4'-(2-hydroxy-3-morpholinopropoxy)-propiophenone and 2-hydroxy-4-(2-hydroxyethoxy)-2-methyl-propiophenone.

3. Ester derivative according to claim 2, wherein the said propiophenone derivative is 2-hydroxy-4-(2-hydroxyethoxy)-2-methylpropiophenone.

4. Ester derivatives according to claim 1, wherein the percentage of carboxylic groups of hyaluronic acid or of hyaluronic acid derivatives esterified with the said propiophenone derivatives of formula (I) is lower than 75%.

5. Ester derivatives according to claim 1, wherein the carboxylic groups not esterified with the said propiophenone derivatives of formula (I) are salified with sodium.

6. Ester derivatives according to claim 1, wherein the said hyaluronic acid derivatives do not comprise C=C bonds and are selected from the group

consisting of:

- hyaluronic acid esters wherein a percentage of the carboxylic groups not exceeding 75% are esterified with alcohols of the aliphatic, araliphatic, cycloaliphatic, aromatic, cyclic and heterocyclic series, and the remaining percentage of not esterified carboxylic groups are salified with quaternary ammonium salts to enable a second esterification with the said propiophenone derivatives of formula (I);

- hyaluronic acid amides wherein a percentage of the carboxylic groups not exceeding 50% are amidated with amines of the aliphatic, araliphatic, cycloaliphatic, aromatic, cyclic and heterocyclic series, and the remaining percentage of not amidated carboxylic groups are salified with quaternary ammonium salts to enable a second esterification with the said propiophenone derivatives of formula (I);

- quaternary ammonium salts of N-sulphated or O-sulphated derivatives of hyaluronic acid; and

- inner esters of hyaluronic acid wherein a percentage of the carboxylic groups not exceeding 20% is esterified with alcoholic groups of the same hyaluronic acid chain or of a different chain, and the remaining percentage of not esterified carboxylic groups is salified with quaternary ammonium salts to enable a second esterification with the said propiophenone derivatives of formula (I).

7. Ester derivatives according to claim 6, wherein the said quaternary ammonium salts are tetrabutyl ammonium salts.

8. Ester derivatives according to claim 6, wherein the said hyaluronic acid ester with alcohols of the aliphatic, araliphatic, cycloaliphatic, aromatic, cyclic and heterocyclic series is a hyaluronic acid ester with benzyl alcohol.

9. Ester derivatives according to claim 6, wherein the said hyaluronic acid amide with amines of the aliphatic, araliphatic, cycloaliphatic, aromatic, cyclic and heterocyclic series is a hyaluronic acid amide with dodecyl amine.

10. Ester derivatives according to claim 1, wherein the said hyaluronic acid or hyaluronic acid derivative has a molecular weight ranging between 150,000 and 1,000,000 Da.

11. Ester derivatives according to any of claims 1-10, characterised in that the said

ester derivatives with propiophenone derivatives of formula (I) are soluble in water.

12. Process for the preparation of the ester derivatives as described in claims 1-11, comprising the reaction of hyaluronic acid or hyaluronic acid derivatives with the bromide of the propiophenone derivatives of formula (I) wherein at least a hydroxy group of the substituent R is replaced by Br, to obtain the ester derivatives.

13. Process according to claim 12, wherein the said bromide of propiophenone derivative is the bromide of 2-hydroxy-4-(2-hydroxyethoxy)-2-methyl-propiophenone.

14. Hydrogel material consisting of a cross-linked product obtained by photocuring an ester derivative as described in claims 1-11.

15. Hydrogel material according to claim 14, wherein the said photocuring is carried out by irradiation with light having a wavelength ranging between 280 and 750 nm.

16. Hydrogel material according to claim 14, wherein the said photocuring is carried out by irradiation with ultraviolet rays.

17. Hydrogel material according to claim 14, wherein the said photocuring is carried out by irradiation with light having a wavelength of 366 nm.

18. Process for the preparation of the hydrogel material as claimed in claims 14-17, comprising photocuring the ester derivatives as claimed in claims 1-11, optionally dissolved in water or in an aqueous solution.

19. Process according to claim 18, wherein the said photocuring is carried out by irradiation with light having a wavelength ranging between 280 and 750 nm.

20. Process according to claim 18, wherein the said photocuring is carried out by irradiation with ultraviolet rays.

21. Process according to claim 18, wherein the said photocuring is carried out by irradiation with light having a wavelength of 366 nm.

22. Process according to claim 18, wherein the said ester derivatives are dissolved in water or in an aqueous solution and their concentration ranges between 0.01 and 100% (w/w).

23. Process according to claim 22, wherein the concentration of the said ester derivatives ranges between 0.1 and 50% (w/w).

24. Process according to claim 18, wherein the said photocuring is carried out in an exposure time ranging between 2 and 30 minutes.

25. Process according to claim 24, wherein the said photocuring is carried out in an exposure time ranging between 3 and 15 minutes.

26. Process according to claim 18, wherein the said photocuring is carried out at a temperature ranging from 1 to 40°C.

27. Process according to claim 26, wherein the said photocuring is carried out at room temperature.

28. Biomedical materials, healthcare products and surgical articles made or coated by the hydrogel material as claimed in claims 14-17.

29. Biomedical materials, healthcare products and surgical articles according to claim 28 selected from the group consisting of catheters, guide channels, cardiac valves, vascular stents, soft tissue prostheses, prostheses of animal origin such as porcine heart valves, artificial tendons and organs, contact lenses and intra-ocular lenses, blood oxygenators, blood bags, surgical instruments, filtrations systems and laboratory instruments.

30. Biomedical materials, healthcare products and surgical articles according to claim 28, coated by the said hydrogel material by means of the plasma coating technique.

31. Scaffolds for the growth of human and animal, differentiated and/or undifferentiated cells comprising the hydrogel material as claimed in claims 14-17.

32. Pharmaceutical composition comprising a hydrogel material as claimed in claims 14-17.

33. Pharmaceutical composition according to claim 32, further comprising a pharmacologically and/or biologically active substance or an association thereof.

34. Pharmaceutical composition according to claim 33, wherein the pharmacologically or biologically active substances are selected from proteins, growth factors, enzymes, antibodies and drugs.

35. Pharmaceutical composition according to claim 32, for topical, subcutaneous, intramuscular, intra-articular and intra-medullar administration.

36. Pharmaceutical composition according to claim 33, wherein the said hydrogel material is the agent for controlled release of the active substances.

37. Use of the hydrogel material as claimed in claims 14-17, in the biomedical, healthcare, surgical fields and as systems for the controlled release of drugs.

38. Use of the hydrogel material according to claim 37, in the prevention of surgical adhesions.

39. Use of the hydrogel material as claimed in claims 14-17, for the preparation of engineered connective tissues.

40. Use of the hydrogel material as claimed in claims 14-17, for the preparation of engineered cartilage.

41. Use of the hydrogel material as claimed in claims 14-17, for the preparation of viscoelastic substitutes of the nucleus pulpous of the intervertebral disk.

42. Use of the hydrogel material as claimed in claims 14-17, for the preparation of visco-integrators of the vitreous humor.

43. Kit for implanting engineered cartilage by arthroscopic surgery comprising an ester derivative as claimed in claims 1-11 dissolved in water or in an aqueous solution, a container for the said ester derivative, and an endoscopic probe with optic fibres suitable for the *in situ* photocuring of the said ester derivative.

44. Kit according to claim 43, further comprising human fibroblasts and/or a drug added to the said ester derivatives.

45. Kit according to claim 43, wherein the said container is a container suitable for injection of the said ester derivative.

46. Kit according to claim 43, wherein the said endoscopic probe is suitable for the *in situ* irradiation by UV rays of the said ester derivative.

47. Use of the hydrogel material as claimed in claims 14-17, for the preparation of engineered cartilage, cross-linked directly at the site of application by arthroscopy.